

Utilizing Weather RADAR For Rapid Location of Meteorite Falls and Space Debris Re-Entry

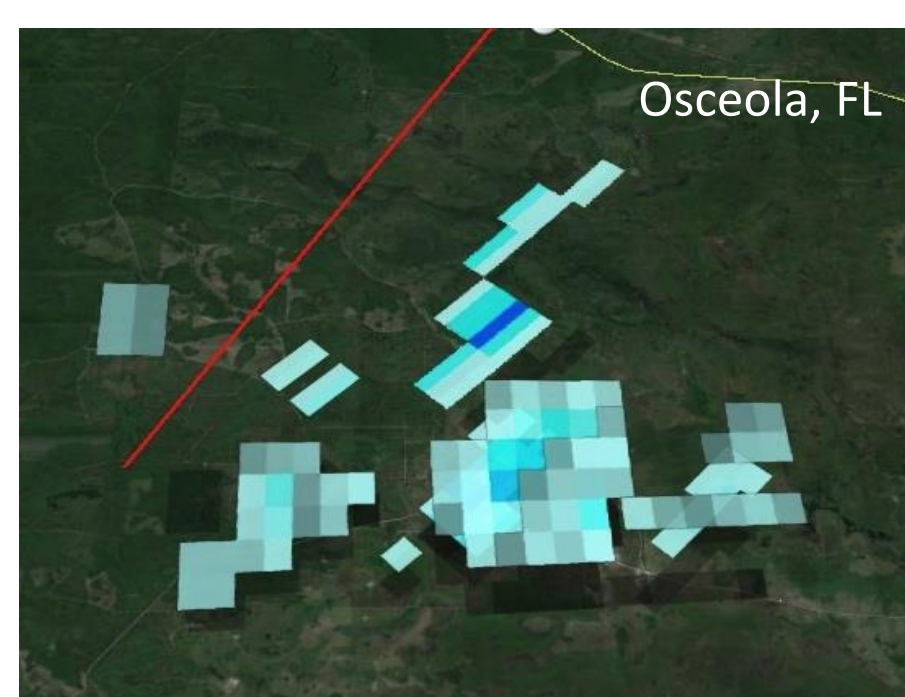
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OVERVIEW

This activity utilizes existing NOAA weather RADAR imagery to locate meteorite falls and space debris falls. The near-real-time availability and spatial accuracy of these data allow rapid recovery of material from both meteorite falls and space debris re-entry events. To date, at least 22 meteorite fall recoveries have benefitted from RADAR detection and fall modeling, and multiple debris re-entry events over the United States have been observed in unprecedented detail.

INNOVATION

Rapid recovery of meteorites demonstrably improves their scientific value, facilitating high quality scientific investigations of material from asteroids, the Moon, and Mars. Accurate and rapid location of space debris facilitates refinement of hazard analysis for people and equipment on Earth's surface, for both air traffic and space-borne assets.



Meteorite Fall Identification: *Upper left:* A meteorite recovered from the Mount Blanco, TX fall (18 Feb 2016). *Upper right:* Composite RADAR image of the 24 Jan 2016 Osceola, FL fall with ground track in red. *Lower left:* Composite RADAR image of the 30 Oct 2012 Addison, AL fall. *Lower Right:* Composite RADAR image of the 15 Apr 2010 Mifflin, WI meteorite fall. All of these events resulted in rapidly recovered meteorites.

OUTCOME

- RADAR imagery has assisted in recovery of 22 meteorite falls in the US and Canada since 1998 (immediately after the events and from archived data)
- Seven space debris re-entry events have been examined in detail using weather RADAR

PARTNERSHIPS / COLLABORATIONS

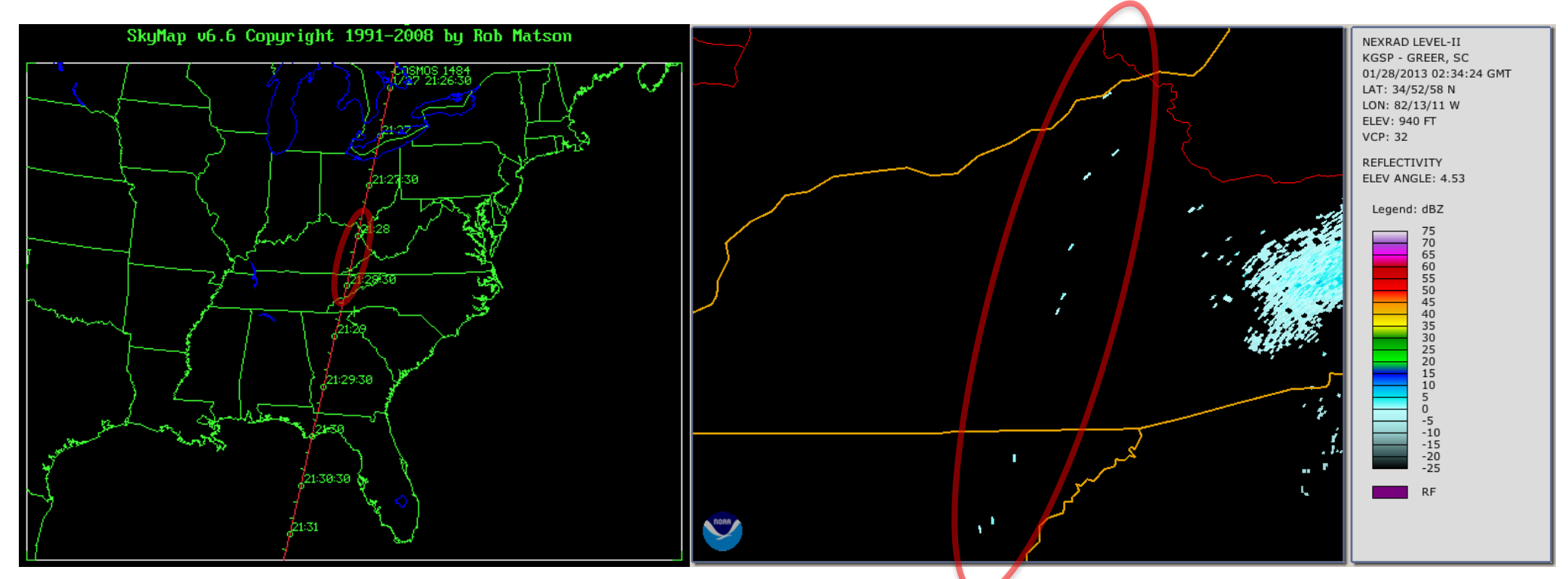
Collaboration with USAF, American Meteor Society, science community, and the public for meteorite falls. And with FAA and DoD for space debris falls.

PAPERS / PRESENTATIONS

Eight meeting abstracts and three peer-reviewed science publications, including one in *Science*.

FUTURE WORK

Refinement of software tools to streamline data processing, and development of methods to directly measure total fall mass from RADAR reflectivity.



Space Debris Identification: *Left:* Ground track of the COSMOS 1484 Earth imaging satellite during its re-entry over the US on 28 Jan 2013. *Right:* RADAR image from the Greer, DC RADAR in the NOAA NEXRAD network. The blue pixels within the red ellipse indicate falling debris from the satellite. RADAR signatures of falling debris appear starting north of Lake Erie and extend south of Atlanta, GA. The red ellipse in the image on the left indicates the position of the red ellipse on the right.